
आइसो प्रोपाइल अल्कोहल — विशिष्टि
(दूसरा पुनरीक्षण)

Iso Propyl Alcohol — Specification
(Second Revision)

ICS 71.080.60

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FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Organic Chemicals, Alcohols and Allied Products Sectional Committee had been approved by the Petroleum, Coal and Related Product Divisional Council.

This standard was first published in 1964 and subsequently revised in 1976. With the increase in production, and on the basis of experience gained in the use of the earlier version of this standard, it was considered imperative to upgrade the minimum quality requirements stipulated in the standard and accordingly first revision was undertaken in which the limit for residue on evaporation was made more stringent. This revision has been undertaken to include requirements of purity, benzene content, and to update cross referred standards.

iso Propyl alcohol is used for a variety of purposes. One of its major uses is as a solvent in the paint and allied industries. In the preparation of this standard, specific consideration has been given to its use as a solvent and it is hoped that this standard will ensure procurement of an assured quality of the material.

The composition of the Committee, responsible for the formulation of this standard is given at Annex C.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

ISO PROPYL ALCOHOL — SPECIFICATION

(Second Revision)

1 SCOPE

This standard prescribes the requirements and the methods of sampling and test for isopropyl alcohol intended for industrial uses, such as solvent in the cosmetics, paint and allied industries.

NOTE — Refer Indian Pharmacopeia for Isopropyl alcohol intended for Pharmaceutical Industries.

2 REFERENCES

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreement based on standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
2362 : 1993	Determination of water by Karl Fischer method — Test method (<i>second revision</i>)
229 : 1993	Ethyl acetate (<i>third revision</i>)
1070 : 1992	Reagent grade water (<i>third revision</i>)
1260 (Part 1) : 1973	Pictorial marking for handling and labelling of goods: Part 1 Dangerous goods (<i>first revision</i>)
1448 (Part 18) : 2020	Methods of test for petroleum and its products: Part 18 Distillation of petroleum products (<i>third revision</i>)
2552 : 1989	Steel drums (galvanized and ungalvanized) (<i>third revision</i>)

3 REQUIREMENTS

3.1 Description

The material shall be a clear, colourless liquid, free from suspended matter and shall consist essentially of propan-2-ol, $[(CH_3)_2CHOH]$.

3.2 Odour

The material shall have the characteristic odour of isopropyl alcohol and shall leave no residual odour after evaporation from filter paper.

3.3 The material shall also comply with the requirements given in Table 1.

Table 1 Requirements for Isopropyl Alcohol
(Clauses 3.3 and 6.1)

SI No.	Characteristic	Requirement	Method of Test, Ref To	
(1)	(2)	(3)	(4)	(5)
(i)	Relative density at 27/27°C	0.781 to 0.785	—	Annex A of IS 229
ii)	Distillation range	Not less than 95 ml shall distil within 2°C including 82.4°C (the temperature being corrected for a pressure of 760 mm Hg)	—	IS 1448 (Part 18)
iii)	Residue on evaporation, g/100 ml, <i>Max</i>	0.004	A-1	—
iv)	Acidity (as CH_3COOH), percent by mass, <i>Max</i>	0.002	—	Annex C of IS 229
v)	Aldehydes and ketones (as acetone), percent by mass, <i>Max</i>	0.20	A-2	—
vi)	Water content, percent by mass, <i>Max</i>	0.5	—	IS 2362
vii)	Purity as Propan-2-ol (Iso propyl alcohol), <i>Min</i>	99.8 Percent	A-3	
viii)	Benzene Content, <i>Max</i>	2 ppm	A-3/ A-4	

4 PACKING AND MARKING

4.1 Packing

4.1.1 Unless otherwise agreed to between the purchaser and the supplier, the material shall be packed in galvanized drums (conforming to IS 2552) / mild steel composite drums- 210 lit capacity /ISO container 14 to 20 kilo liter capacity (or in any other containers subject to the provisions of the law in force in the country for the time being).

4.1.2 All containers in which the material is packed shall be dry and clean so that no impurities harmful to the end use of the material are introduced. The sample can be packed in glass bottle of 100 ml.

4.2 Marking

4.2.1 The material shall be supplied in accordance with the marking and delivery instructions given by the purchaser.

4.2.2 Each container shall be marked with the following information:

- a) Name of the material;
- b) Manufacturer's name, initials, or his trade-mark, if any;
- c) Gross, net and tare mass;
- d) Date of packing; and
- e) Safety instruction.

4.2.3 Each container shall have the caution label 'FLAMMABLE' together with the corresponding symbol for labelling of dangerous goods [see Fig. 5 of IS 1260 (Part 1) : 1973].

NOTES:

1 Necessary safeguards against the risk arising from storage and handling of large volumes of flammable liquids shall be provided and all due precautions shall be taken at all times to prevent accidents by fire or explosion.

2 Except when they are opened for the purpose of cleaning and rendering them free from isopropyl alcohol vapors, all empty tanks or other containers shall be kept securely closed unless they have been cleaned and freed from isopropyl alcohol vapors.

4.2.4 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.⁷

5 SAMPLING

5.1 Preparation of Test Samples

Representative samples of the material shall be drawn as prescribed in Annex B.

5.2 Number of Tests

Tests for the determination of all the characteristics specified shall be conducted on the composite sample.

5.3 Criteria for Conformity

The material shall be taken as conforming to this standard if the test results of the composite test sample satisfy all the requirements prescribed.

6 TEST METHODS

6.1 Tests shall be conducted according to the methods prescribed in various Indian Standards and Annex A to this standard. References to the relevant clauses of Annex A and different standards are given in column 4 and 5 of Table 1 respectively.

6.2 Quality of Reagents

Unless specified otherwise, pure chemicals and distilled water (see IS 1070) shall be employed in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

ANNEX A

(Table 1, and Clause 6.1)

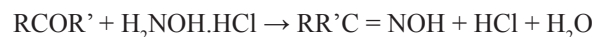
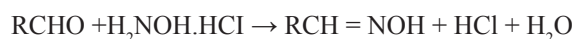
METHODS OF TEST FOR ISO PROPYL ALCOHOL

A-1 DETERMINATION OF RESIDUE ON EVAPORATION**A-1.1 Procedure**

Evaporate 100 ml of the material to dryness in a weighed platinum or silica or borosilicate glass basin on a water-bath. Dry the residue in an oven at a temperature of $100 \pm 2^\circ\text{C}$ to constant mass. Cool in a desiccator and weigh. Report the mass of the residue in grams per 100 ml.

A-2 DETERMINATION OF ALDEHYDES AND KETONES**A-2.0 Principle**

Reaction with hydroxylamine hydrochloride forms the basis for the determination of carbonyl function (aldehydes and ketones), according to the equations given below:



The hydrochloric acid released is titrated with standard sodium hydroxide solution using bromophenol blue as indicator.

A-2.1 Reagents**A-2.1.1 Standard Sodium Hydroxide Solution, 0.1 N.****A-2.1.2 Carbonyl-free Ethanol**

Reflux 500 ml of 95 percent (v/v) ethanol (industrial methylated spirit is not suitable) with 5 g of 2, 4-dinitrophenyl-hydrazine and 5 drops of concentrated hydrochloric acid (r. d.= 1.18) for 2 to 3 h. Distil off the ethanol slowly using a suitable distillation column of size 300×25 mm. Reject the first 50 ml and collect the next 490 ml distillate, rejecting the remainder. If, in spite of the precautions taken, the distillate is found to be coloured, then it should be redistilled.

A-2.1.3 Bromophenol Blue Indicator

Dissolve 0.2 g of bromophenol blue in 3.0 ml of the standard sodium hydroxide solution and dilute to 100 ml with carbonyl-free ethanol.

A-2.1.4 Hydroxylamine Hydrochloride Solution

Dissolve 4 g of hydroxylamine hydrochloride in 20 ml of water. Dilute this to 200 ml with carbonyl-free

ethanol, heat on a boiling water-bath for 30 min, cool and add 5 ml of bromophenol blue indicator with just sufficient sodium hydroxide solution (2N) to impart a yellow-green colour to the liquid.

A-2.2 Procedure

Measure 25 ml of the material into a 250 ml conical flask, add 25 ml of hydroxylamine hydrochloride solution and, after loosely stoppering, heat on a boiling water-bath for 10 min. Cool and titrate with standard sodium hydroxide solution until as near a match as possible is obtained with a control made by mixing 25 ml of distilled water with 25 ml of hydroxylamine hydrochloride in a similar 250-ml conical flask.

A-2.3 Calculation

Aldehydes and ketones (as acetone), percent by mass = $\frac{0.23 V}{D}$

Where,

V = volume in ml, of standard sodium hydroxide solution used; and

D = relative density of the material taken at the temperature of the test.

NOTE — Alternate Method for Determination of Aldehydes And Ketones : Total carbonyls can also be calculated from the chromatographic analysis. Calculate total carbonyls using capillary gas chromatography results.

A-3 DETERMINATION OF PURITY AND BENZENE CONTENT**A-3.1 Reagents (Use Analytical Grade Reagents)****A-3.1.1 Iso Propyl Alcohol****A-3.1.2 Acetone****A-3.1.3 Di-isopropyl Alcohol****A-3.1.4 2-Butanol****A-3.1.5 Cyclohexane****A-3.1.6 Benzene****A-3.1.7 Standard Benzene Solution (2 ppm)**

Take 0.1 gm benzene grade in 100 ml volumetric flask and dilute with test sample, further dilute 0.20 ml of this solution upto 100 ml with test sample (b).

A-3.2 Procedure

For determination of Purity and benzene content, use suitable gas chromatograph instrument having flame ionization detector and capillary column arrangement (FID). Set the chromatographic conditions as given below.

A-3.2.1 Gases for GC

- Hydrogen (pure grade);
- Air (pure grade); and
- Helium /nitrogen (pure grade).

A-3.2.2 GC Conditions

Carrier gas flow	: 2.87 ml/min (Linear Velocity = 35cm/sec.)
Split ratio	: 50:1
Column	: (DB 624) Id 0.25-mm × 60-mtr fused silica, coated with 1.4-µm film of phase G 43) or equivalent
Injection size	: 1 µl
Injector temp	: 150°C
Detector temp.	: 200°C
Oven programming	: 35°C hold for 5 min to 45°C @ 1°C to 100°C @ 10°C hold for 1 min

A-3.2.3 Sample Injection Sequence

- Blank run (inject again blank if baseline is not stable);
- Inject benzene standard solution (2 ppm);
- Blank run; and
- Inject 1 µl sample as such.

Check the relative retention time (RRT) of benzene and other possible impurities by injecting individual impurities.

Relative retention time of some of the possible impurities: -

Name	Relative Retention Time
Acetone	0.9
Isopropyl alcohol	1.0
Di-isopropyl ether	1.4
n-propyl alcohol (1-propanol)	1.5
2-Butanol	1.76
Cyclohexane	1.84
Benzene	1.95

A-3.3 Calculation

$$\text{Purity (propane -2 -ol), (percent by area)} = \frac{\text{Area of isopropyl alcol peak}}{\text{Total area of all peaks}} \times 100$$

Benzene Content (PPM) =

$$\frac{\text{wt of benzene (gm)} \times 0.2 \times \text{Area of benzene peak from sample test}}{100 \times 100 \times \text{Area of benzene peak from standard test (b)}} \times 10^6$$

NOTE — The above gas chromatographic (GC) conditions are suggestive. However, any GC method having difference in detector, column packing material and type (like packed / capillary, diameter, length, film thickness etc), Calibration technique (internal std, external std, area normalization, percent area etc), carrier gas (He, H₂, N₂) may be used with applicable GC operating parameters, provided standardization and calibration of the components is established after setting GC parameters for the resolution and accuracy level as specified in this standard.

A-4 BENZENE CONTENT BY INTERNAL STANDARD TEST METHOD (ALTERNATE TEST METHOD)**A-4.1 Reagents (Use Analytical Grade Reagents)****A-4.1.1 Iso Propyl Alcohol****A-4.1.2 2-Butanol****A-4.1.3 Benzene****A-4.2 Procedure**

For determination of benzene use suitable gas chromatograph instrument having flame ionization detector and capillary column arrangement. Set the chromatographic conditions as given below:

- Gases for GC;
- Hydrogen (pure grade);
- Air (pure grade);
- Helium /nitrogen (pure grade); and
- GC conditions.

Any suitable GC instrument with Flame Ionisation detector (FID) and capillary column arrangement :

Carrier gas	: 2.87 ml/min (linear velocity = 35 cm/sec.)
Split ratio	: 5:1
Column	: (BP 624) Id 0.32-mm × 30-mtr fused silica, coated with 1.8-µm film of phase G43) or equivalent
Injection size	: 1 µl
Injector temp	: 280°C
Detector temp	: 280°C
Oven programming	: 40°C initial hold for 12 min. 10°C/min to 240°C hold 10 min

A-4.2.1 Preparation of Reagents**A-4.2.1.1 Internal standard of 2 butanol (a) (5ppm)**

In 100 ml volumetric flask take small amount of *iso* propyl alcohol to this add 0.1 gm of 2 butanol and dilute (b). Take 5 ml of (b) solution in 1000 ml volumetric flask and dilute it with Iso propyl alcohol (5 ppm).

A-4.2.1.2 Standard preparation of Benzene (1, 2, 3, 4, 5 ppm)

In 100 ml volumetric flask take small amount of *iso* propyl alcohol to this add 0.1gm of benzene and dilute. Prepare 1,2,3,4,5 ppm of benzene solution by taking 0.1, 0.2, 0.3, 0.4, 0.5 ml from above solution in 100 ml volumetric flask and dilute internal standard of 2 butanol (a).

A-4.2.1.3 Sample preparation(c)

Take 0.5 ml of (b) and dilute to 100 ml with sample.

Set the chromatographic conditions as above and inject 1 µl substance to be examined. Check the RRT of possible impurities by injecting pure standards of impurities in the GC separately.

A-4.2.2 Sample Injection Sequence

- a) Blank run (Inject again blank if baseline is not stable);

- b) Inject each 1 µl standard preparation of benzene 1, 2, 3, 4, 5 ppm);
c) Blank run; and
d) Inject 1 µl sample preparation (c).

Relative retention time of components:

Name	Relative Retention Time
Isopropyl alcohol	1.00
2-Butanol	2.02
Benzene	2.64

Linearity of benzene — Correlation coefficient NLT 0.99

A-4.3 Calculation

$$\text{Constant}(F) = \frac{\text{Conc of benzene std 2ppm} \times \text{Area of internal std}}{\text{Area of benzene std 2ppm} \times \text{Conc of internal std}}$$

Benzene content (PPM) =

$$\frac{F \times \text{Conc of internal Std} \times \text{Area of Benzene in sample}}{\text{Area of internal standard in sample}}$$

Benzene content calculation may be based as per using software application.

ANNEX B

(Clause 5.1)

SAMPLING OF ISO PROPYL ALCOHOL**B-1 GENERAL REQUIREMENTS OF SAMPLING**

B-1.0 In drawing, preparing, storing and handling test samples the following precautions and directions shall be observed.

B-1.1 Samples shall be taken in a protected place with good ventilation and kept away from flame.

B-1.2 The sampling instrument /device shall be clean and dry.

B-1.3 The samples, the material being sampled, the sampling instrument/device and the containers for samples shall be protected from adventitious contamination.

B-1.4 To draw a representative sample, the contents of each container selected for sampling shall be mixed as thoroughly as possible by shaking or stirring or both, or by rolling, so as to bring all portions into uniform

distribution (in case of large storage tank, sampling should be done after proper circulation/mixing).

B-1.5 The samples shall be placed in suitable, clean, dry and airtight glass containers.

B-1.6 The sample containers shall be of such a size that they are almost, but not completely, filled by the sample.

B-1.7 Each sample container shall be sealed airtight with a suitable stopper after filling and marked with the manufacturers' name or trade-mark, the month and year of manufacture of the material, the batch number (if available) and other details of sampling such as the date of sampling, sampler's name, etc.

B-1.8 Samples shall be stored in such a manner that the temperature of the material does not vary unduly from the normal temperature.

B-2 SAMPLING INSTRUMENTS/DEVICE

B-2.0 The following forms of sampling instruments/device may be used:

- Weighted sampling can for taking samples from various depths in large tanks, and
- Sampling tube.

B-2.1 Weighted Sampling Can

Of suitable capacity, 500 to 1000 ml and of such a weight as to sink readily in the material to be sampled. It has a long chain or cord attached to permit filling at any desired level (*see* Fig. 1). The metal used to weight the apparatus shall be fitted externally, as irregularities in the metal are likely to contaminate the sample if the weight is fitted internally.

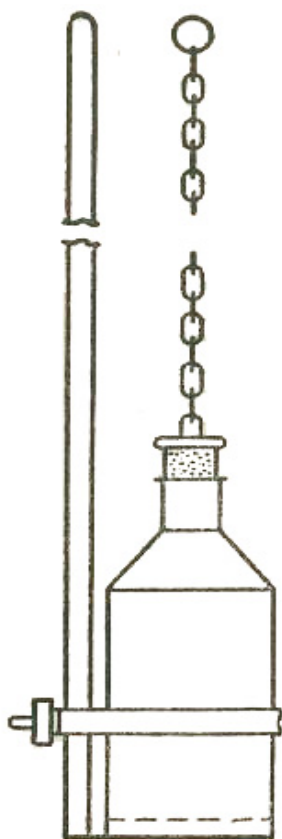


FIG.1 WEIGHTED SAMPLING CAN

B-2.2 Sampling Tube

It is made of metal or thick glass and is 20 to 40 mm in diameter and 400 to 800 mm in length (*see* Fig. 2). The upper and lower ends are conical and reach 5 to 10 mm diameter at the narrow ends. Handling is facilitated by two rings at the upper end. For taking a sample, the apparatus is first closed at the top with the thumb or a stopper and lowered until the desired depth is reached. It is then opened for a short time to admit the material and finally closed and withdrawn.

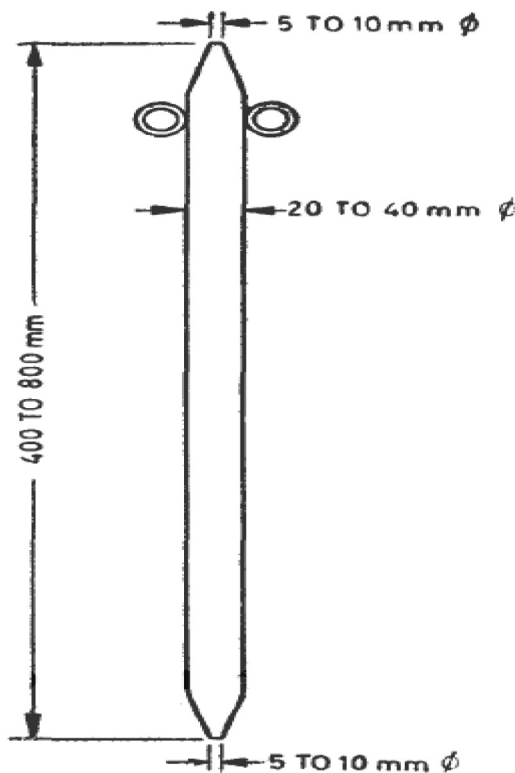


FIG.2 SAMPLING TUBE

B-2.2.1 For small containers, the size of the sampling tube may be altered suitably.

B-3 SCALE OF SAMPLING

B-3.1 Lot

In any consignment all the containers of the same size and drawn from the same batch of manufacture shall constitute a lot. If a consignment is known to consist of different batches of manufacture or of different sizes of containers, the containers belonging to the same batch and size shall be grouped together and each such group shall constitute a separate lot.

B-3.2 For ascertaining the conformity of the material in a lot to the requirements of this standard, tests shall be carried out for each lot separately. For this purpose, 5 containers shall be selected at random from each lot

NOTE — In the case of very small lots where the selection of 5 containers may be uneconomical, the number of containers to be selected and the method of judging the conformity of the lot to the requirements of the standard shall be as agreed to between the purchaser and the supplier

B-3.3 The containers shall be selected at random and to ensure randomness of selection, the following procedure is recommended for use:

Starting from any container in the lot, count them as 1,2,..... up to r and so on in one order, where r is the integral part of $N/5$ (N being the number of containers

in the lot). Every r th container thus counted 'shall be withdrawn to constitute a sample till the required number of 5 containers is obtained.

B-4 PREPARATION OF TEST SAMPLES

B-4.1 From each of the containers selected according to **B-3.3**, a representative portion of the material sufficient for carrying out tests as prescribed in 2 shall be drawn with the help of a suitable sampling instrument /device (*see B-2*).

B-4.2 Out of these portions, equal quantity of material shall be taken and mixed thoroughly to form a

composite sample of about 1 500 ml. The composite test sample shall be divided into 3 equal parts, one for the purchaser, and another for the supplier and the third to be used as a referee sample.

B-4.3 The composite samples shall be transferred to separate containers and shall be sealed and marked with full identification particulars given in **B-1.7**.

B-4.4 The referee test sample shall also bear the seal of both the purchaser and the supplier. It shall be kept at a place agreed to between the purchaser and the supplier, to be used in the case of dispute between the two.

ANNEX C

(Foreword)

COMMITTEE COMPOSITION

Organic, Chemicals Alcohols and Allied Products Sectional Committee, PCD 09

<i>Organization(s)</i>	<i>Representative(s)</i>
Chemical Engineering and Process Development Division, NCL PUNE	DR C. V. RODE (Chairman)
All India Distilleries Association (AIDA), New Delhi	SHRI V. N. RAINA
BASF India Limited, Mumbai	SHRI KIRAN BHAT SHRI HEMAL BERAWALA (<i>Alternate</i>)
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Central Revenues Control Laboratory, Delhi	DR T. A. SREENIVASA RAO
Chemical and Petrochemicals Manufacturers Association (CPMA), New Delhi	SHRI KAMAL NANAVATY
Deepak Fertilizer, Pune	DR SATISH CHAND SAINI SHRI SURESH AMLE (<i>Alternate</i>)
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National Chemical Laboratory, Pune	DR UDAYA KIRAN MARELLI
UPL Limited, Mumbai	MR M. D. VACHHANI, GM (QA)
Alkyl Amines Chemicals Ltd, Mumbai	SHRI S. V. NIKUMBHE SHRI SAMEER KATDARE (<i>Alternate</i>)
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Member Secretary

SHRI CHANDRAKESH SINGH

SCIENTIST 'D' (PCD), BIS

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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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